- measuring in a first region of the well a first pair of:

(i) the local speed of the flowing fluid in a first location of the well; and

(ii) the local proportions of the flowing fluid in a second location of the well, such that said first and second locations are in alignment with each other on a line parallel to the axis of the well;

- measuring simultaneously in a second region of the well a second pair of said local speed and said local proportions, wherein the first and the second regions are in the same plane containing the axis of the well.

33. (New) A method as claimed in claim 32, wherein said first and second regions are distributed across the entire width of the well.

34. (New) A method according to claim 32, wherein said plane containing the axis of the well is vertical.

35. (New) A method as claimed in claim 32, wherein the well is inclined from vertical, the method comprising measuring a first pair of local speed and local proportions of the flowing fluid in a first region lying at the bottom of the vertical plane of the well, and measuring second pairs of local speed and local proportions of the flowing fluid in second regions distributed across the entire width of the well in the vertical plane.

36. (New) A method as claimed in claim 32, wherein said first and second locations are at the same point in each first and second regions.

37. (New) Apparatus for determining flow rates in a multiphase fluid flowing in a well, comprising:

- a tool body to be positioned in the well;
- a first and a second sensor pairs, each sensor pair comprising:
  a) speed sensor mounted on the tool body for measuring local speed of the flowing fluid in a first location of the well; and

- measuring in a first region of the well a first pair of:

(i) the local speed of the flowing fluid in a first location of the well; and

(ii) the local proportions of the flowing fluid in a second location of the well, such that said first and second locations are in alignment with each other on a line parallel to the axis of the well;

- measuring simultaneously in a second region of the well a second pair of said local speed and said local proportions, wherein the first and the second regions are in the same plane containing the axis of the well.

33. (New) A method as claimed in claim 32, wherein said first and second regions are distributed across the entire width of the well.

34. (New) A method according to claim 32, wherein said plane containing the axis of the well is vertical.

35. (New) A method as claimed in claim 32, wherein the well is inclined from vertical, the method comprising measuring a first pair of local speed and local proportions of the flowing fluid in a first region lying at the bottom of the vertical plane of the well, and measuring second pairs of local speed and local proportions of the flowing fluid in second regions distributed across the entire width of the well in the vertical plane.

36. (New) A method as claimed in claim 32, wherein said first and second locations are at the same point in each first and second regions.

37. (New) Apparatus for determining flow rates in a multiphase fluid flowing in a well, comprising:

- a tool body to be positioned in the well;
- a first and a second sensor pairs, each sensor pair comprising:
  a) speed sensor mounted on the tool body for measuring local speed of the flowing fluid in a first location of the well; and

b) proportion sensor mounted on the tool body for measuring local proportions of the fluid flowing in a second location of the well;

wherein said speed and proportion sensors are arranged such that said first and second locations are in alignment with each other on a line parallel to the axis of the well;

wherein said first and second sensor pairs lie in the same plane containing the axis of the well.

38. (New) Apparatus as claimed in claim 37, wherein, in use, said pairs of speed and proportions sensor means are distributed across the entire width of the well.

39. (New) Apparatus as claimed in claim 38, wherein when the well is inclined from vertical, said plane containing the axis of the well is vertical and the first pair of speed and proportions sensor means lies at the bottom of said vertical plane.

40. (New) Apparatus as claimed in claim 39, further comprising a pair of speed and proportions sensor means lying at the top of the vertical plane of the well

41. (New) Apparatus as claimed in claim 37, wherein each pair of the speed sensor means (26) and the proportions sensor means (28) are included in multi-sensor assemblies (24).

42. (New) A method of determining flow rates in a multiphase fluid flowing in a well, comprising:

(i) measuring local speed of the flowing fluid in a region of the well; and

(ii) measuring local proportions of the fluid flowing in a region of the well;

wherein the region in which the local speed is measured and the region in which the local properties are measured lie in a vertical plane of the well;

(iii) measuring both local speed and local proportions of the phases in at least two regions that lie in a vertical plane of the well which includes the longitudinal axis of the well and are offset from each other parallel to the axis of the well.

43. (New) A method as claimed in claim 42, comprising measuring local speed and local proportions of phases at regions distributed across the entire width of the well.

44. (New) A method as claimed in claim 42, wherein the well is inclined from vertical, the method comprising measuring local speed and local proportions of phases at a region lying at the bottom of the vertical plane of the well, and measuring local speed and local proportions of phases at other regions distributed across the entire width of the well in the vertical plane.

45. (New) A method as claimed in claim 44, further comprising measuring local speed and local proportions of phases at a region lying at the bottom of the vertical plane of the well

B' (Cont'd)

46. (New) A method as claimed in claim 42, in which a section element (Δsi) of the well is assigned to each region, and the overall flow rate Q of each phase is determined from the relationship:

$$Q = \sum_i q_i \cdot \frac{\Delta si}{S}$$

where S is the total vertical section of the well

and q_i is the flow rate of each phase in section element Δsi,

with $q_i = v_i.h_i$

where v_i is the local speed of each phase in section element Δsi

and h_i is the local proportion of each phase in section element Δsi.

47. (New) A method as claimed in claim 42, comprising measuring the local speed and local proportions of the phases at the same point in each region.

48. (New) A method as claimed in claim 42, comprising, in each region, measuring local speed and local proportions of phases in different locations that are aligned with each other parallel to the longitudinal axis of the well.

49. (New) Apparatus for determining flow rates in a multiphase fluid flowing in a well, comprising:

(i) a tool body to be positioned in the well;

(ii) speed sensor mounted on the tool body for measuring local speed of the flowing fluid in a region of the well; and

(iii) proportion sensor mounted on the tool body for measuring local proportions of the fluid flowing in a region of the well;

B1 (cont'd)

wherein:

- the region in which the local speed is measured and the region in which the local properties are measured lie in a vertical plane of the well; and

- said local speed and proportion sensors are provided for measuring both local speed and local proportions of the phases in at least two regions that lie in a vertical plane of the well which includes the longitudinal axis of the well and are offset from each other parallel to the axis of the well.

50. (New) Apparatus as claimed in claim 49, wherein, in use, the local speed and proportion sensors lie at regions distributed across the entire width of the well.

51. (New) Apparatus as claimed in claim 49, wherein when the well is inclined from vertical, local speed and proportion sensors are provided at a region lying at the bottom of the vertical plane of the well and for measuring local speed and local proportions of phases at other regions distributed across the entire width of the well in the vertical plane.

52. (New) Apparatus as claimed in claim 51, further comprising local speed and proportion sensors for measuring local speed and local proportions of phases at a region lying at the top of the vertical plane of the well.

53. (New) Apparatus as claimed in claim 49, further comprising means for orienting the tool body such that the local speed and proportion sensors lie across the entire width of the well in the vertical plane.

54. (New) Apparatus as claimed in claim 49, wherein, in use, the tool body rests under the influence of gravity, against the bottom of the well, and including at least one deployable arm supported by the body at one end and capable of being applied against the top of the well, in which at least some of the local speed and proportion sensors are mounted on the deployable arm.

B1 (Cont.)

55. (New) Apparatus as claimed in claim 49, wherein, in use, the tool body is centered about the axis of the well by centering means including at least two deployable arms mounted on the body and capable of being applied respectively against the bottom and top of the well, in which at least some of the local speed and proportion sensors are mounted on the deployable arms.

56. (New) Apparatus as claimed in claim 49, wherein the local speed and proportion sensors comprise multi-sensor assemblies, each including the means for determining the local speed of the fluid and the means for determining the local proportions of the phases.

57. (New) Apparatus as claimed in claim 49, wherein, in use, the local speed and proportion sensors are mounted in distinct locations in each region that are substantially in alignment with each parallel to the axis of the well.